

WHAT IS CLAIMED IS:

1. An electrolyte for a lithium secondary battery, comprising a non-aqueous organic solvent including 20 to 95 vol% of an ester-based or ether-based organic solvent based on total amount of organic solvent; one or more lithium salts; and an additive compound having at least two carbonate groups.

2. The electrolyte for a lithium secondary battery according to claim 1, wherein the ester-based or ether-based organic solvent is used in an amount of 30 to 95 vol%.

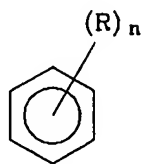
3. The electrolyte for a lithium secondary battery according to claim 1, wherein the organic solvent is an ester-based organic solvent selected from the group consisting of γ -butyrolactone (γ -BL), n-methyl acetate, n-ethyl acetate, and n-propyl acetate.

4. The electrolyte for a lithium secondary battery according to claim 1, wherein the ether-based organic solvent is dibutyl ether.

5. The electrolyte for a lithium secondary battery according to claim 1, wherein the electrolyte further comprises a carbonate-based solvent or a mixture of a carbonate-based solvent and an aromatic hydrocarbon organic solvent.

6. The electrolyte for a lithium secondary battery according to claim 5, wherein the electrolyte comprises a carbonate-based solvent selected from the group consisting of dimethyl carbonate (DMC), diethyl carbonate (DEC), methylpropyl carbonate (MPC), ethylpropyl carbonate (EPC), methylethyl carbonate (MEC), ethylene carbonate (EC), propylene carbonate (PC), butylene carbonate (BC), and mixtures thereof.

7. The electrolyte for a lithium secondary battery according to claim 5, wherein the electrolyte comprises an aromatic hydrocarbon organic solvent represented by Formula (1):



(1)

wherein R is a halogen or a C₁ to C₁₀ alkyl, and n is an integer of 0 to 6.

8. The electrolyte for a lithium secondary battery according to claim 1, wherein the one or more lithium salts are selected from the group consisting of LiPF₆, LiBF₄, LiSbF₆, LiAsF₆, LiClO₄, LiCF₃SO₃, Li(CF₃SO₂)₂N, LiC₄F₉SO₃, LiSbF₆, LiAlO₄, LiAlCl₄, LiN(C_xF_{2x+1}SO₂)(C_yF_{2y+1}SO₂), where x and y are natural numbers, LiCl, and LiI.

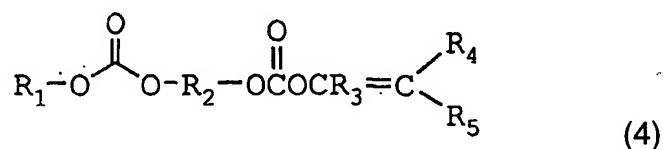
9. The electrolyte for a lithium secondary battery according to claim 8, wherein the one or more lithium salts are present in a concentration ranging from 0.6 to 2.0 M.

10. The electrolyte for a lithium secondary battery according to claim 1, wherein the additive compound has both carbonate groups and double bonds.

11. The electrolyte for a lithium secondary battery according to claim 10, wherein the carbonate groups comprise cyclic and/or linear carbonates.

12. The electrolyte for a lithium secondary battery according to claim 11, wherein the additive compound comprises a cyclic carbonate bound with a cyclic carbonate; a linear carbonate bound with a linear carbonate; or a cyclic carbonate bound with a linear carbonate.

13. The electrolyte for a lithium secondary battery according to claim 12, wherein the additive compound is a carbonic acid ester compound of the following Formula (4):

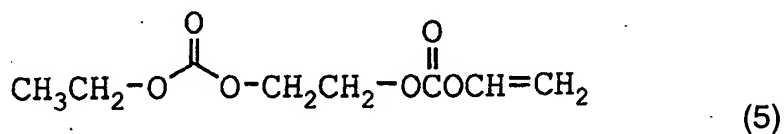


(4)

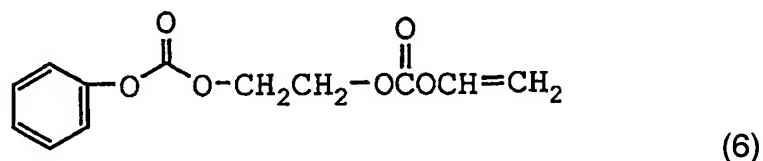
wherein R₁ is hydrogen, a C₁ to C₆ alkyl, or a C₆ to C₁₂ aryl; R₂ is (CH₂)_n, where n is an integer of 1 to 6; R₃ is hydrogen, a C₁ to C₆ alkyl, or a C₆ to C₁₂ aryl; and R₄ and

R₅ are each independently hydrogen or a C₁ to C₆ alkyl.

14. The electrolyte for a lithium secondary battery according to claim 13, wherein the carbonic acid ester compound is selected from the group consisting of a compound of Formula (5):

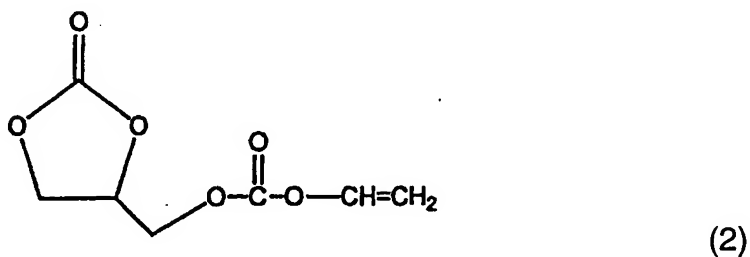


a compound of Formula (6):

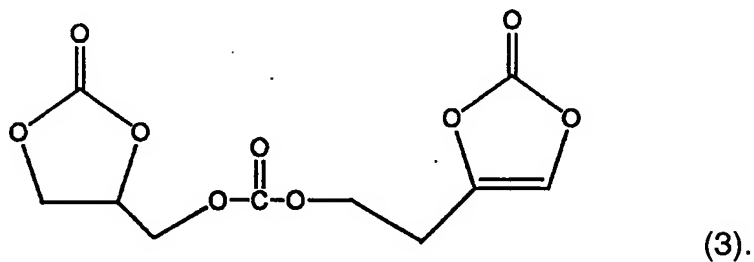


and a mixture thereof.

15. The electrolyte for a lithium secondary battery according to claim 11, wherein the additive compound is represented by the following Formula (2):



or Formula (3):



16. The electrolyte for a lithium secondary battery according to claim 1,

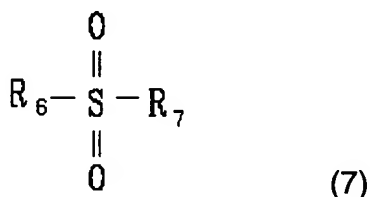
wherein the additive compound is present in an amount of 0.1 to 10 wt% based on the total amount of the electrolyte.

17. The electrolyte for a lithium secondary battery according to claim 1, wherein the electrolyte further comprises a secondary additive compound selected from the group consisting of vinylene carbonates, organic sulfone-based compounds, and mixtures thereof.

18. The electrolyte for a lithium secondary battery according to claim 17, wherein the vinylene carbonate is present in an amount of 0.1 to 50 wt% based on the total amount of the electrolyte.

19. The electrolyte for a lithium secondary battery according to claim 17, wherein the organic sulfone-based compound is present in an amount of 0.1 to 5 wt% based on the total amount of the electrolyte.

20. The electrolyte for a lithium secondary battery according to claim 17, wherein the secondary additive compound is an organic sulfone-based compound represented by the following Formula (7):



wherein R_6 and R_7 are each independently selected from the group consisting of primary, secondary, and tertiary alkyl groups, alkenyl groups, aryl groups, and cycloalkyl groups.

21. The electrolyte for a lithium secondary battery according to claim 20, wherein one of R_6 and R_7 is an alkenyl.

22. The electrolyte for a lithium secondary battery according to claim 16, wherein the secondary additive compound is vinyl sulfone.

23. A lithium secondary battery comprising a positive electrode comprising a material that is capable of reversible intercalation/deintercalation of lithium ions;

a negative electrode comprising a lithium metal, a lithium-containing alloy, or a material that is capable of reversible intercalation/deintercalation of lithium ions as a negative active material, or a material that is capable of reversibly forming a lithium-containing compound as a negative active material;

a separator interposed between the positive and negative electrodes; and

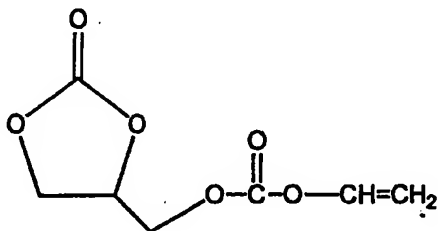
an electrolyte comprising a non-aqueous organic solvent including 20 to 95 vol% of an ester-based or ether-based organic solvent based on the total amount of organic solvent; one or more lithium salts; and an additive compound having at least two carbonate groups.

24. The lithium secondary battery according to claim 23, wherein the additive compound has both carbonate groups and double bonds.

25. The lithium secondary battery according to claim 24, wherein the carbonate groups comprise cyclic or linear carbonates.

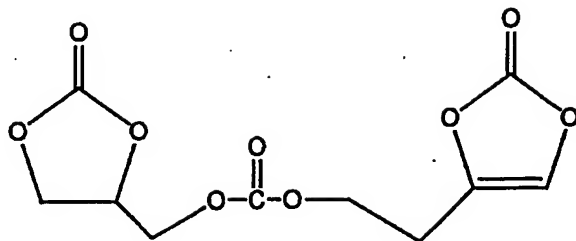
26. The lithium secondary battery according to claim 25, wherein the additive compound comprises a cyclic carbonate bound with a cyclic carbonate; a linear carbonate bound with a linear carbonate; or a cyclic carbonate bound with a linear carbonate.

27. The lithium secondary battery according to claim 26, wherein the additive compound is represented by Formula (2):



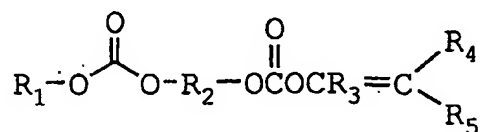
(2)

or Formula (3):



(3).

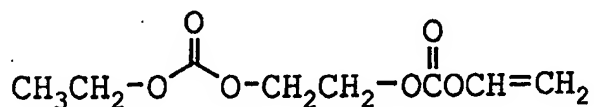
28. The lithium secondary battery according to claim 26, wherein the additive compound is a carbonic acid ester compound of the following Formula (4):



(4)

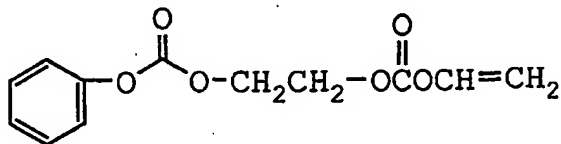
wherein R_1 is hydrogen, a C_1 to C_6 alkyl, or a C_6 to C_{12} aryl; R_2 is $(CH_2)_n$, where n is an integer of 1 to 6; R_3 is hydrogen, a C_1 to C_6 alkyl, or a C_6 to C_{12} aryl; and R_4 and R_5 are each a hydrogen or a C_1 to C_6 alkyl.

29. The lithium secondary battery according to claim 28, wherein the carbonic acid ester compound is selected from the group consisting of a compound of Formula (5):



(5)

a compound of Formula (6):



(6)

and a mixture thereof.

30. The lithium secondary battery according to claim 23, wherein the additive compound is present in an amount of 0.1 to 10 wt% based on the total amount of the electrolyte.

31. The lithium secondary battery according to claim 23, wherein the electrolyte further comprises a secondary additive compound selected from the group consisting of vinylene carbonates, organic sulfone-based compounds, and mixtures thereof.

5 32. The lithium secondary battery according to claim 23, wherein the positive active material is a lithium-nickel-based or a lithium-nickel-manganese-based compound.